ENERGY NEWS

A quarterly publication of the Energy and Utilities Department

Naval Facilities Engineering Service Center

Whole-Building Design

Design Guide Available Soon

Buildings are deceptively complex and consume an extraordinary share of America's energy and material resources. In the past we would confront this problem by analyzing the individual components and subsystems for each building type and try to optimize each of them separately. A new mode of thinking is required to address the whole-building concept. The integration of energy efficiency, appropriate mechanical equipment for comfort and indoor air quality (IAQ), optimized site design, and the best use of both conventional and renewable energy sources is essential. Whole-building design supports sustainable design, environmental concerns, and energy savings in addition to the benefits of energy cost savings.

The whole-building design approach asks the members of the design and construction team to look at the materials, systems, and assemblies from many different perspectives. The design is evaluated for cost, quality-of-life, future flexibility, efficiency, overall environmental impact, productivity, and creativity. A successful whole-building design is a solution that is greater than the sum of its parts. The fundamental challenge of whole-building design is to understand that all building systems are interdependent. Utilizing a systematic analysis of these interdependencies, a much more efficient and cost-effective building can be produced. For example, the choice of a mechanical system might impact the quality of the air in the building, the ease of maintenance, operating costs, fuel choice, or whether the windows of a building are operable.

The NAVFAC Energy Criteria Team recognized the benefits of providing building designs that deal with the building as an overall system. Elements of this overall system include life cycle costs, O&M, environmental concerns, sustainability issues, renewable energy sources, and an integrated design process. The team working with the NAVFAC Criteria Office and the Passive Solar Industries Council (PSIC) began development of the Whole-Building Design Guide concept. We anticipate other government activities will provide additional financial support to expand the guidance. We are pleased to report a strong, positive interest from government and industry for this product.

The initial guidelines, scheduled for a January release, will include the overview module, resource guides, building energy goals, and resource pages. The guidance will:

- Replace outdated, redundant criteria documents.
- Move the Navy and Marine Corps building process more in-line with the private sector.
- Simplify access to information using a single document and a newly developed web site.
- Guide the A&E and project managers through the whole-building approach to design.
- Provide specific energy-use targets and environmental guidance consistent with commercial practice.

The resource pages will address topics such as:

- Daylighting
- Energy efficient lighting and controls
- Passive solar heating strategies
- Natural ventilation
- Complying with ASHRAE 90.1
- Sustainability

Additional resource guides and scope increases will depend upon future funding. Questions concerning these guidelines may be addressed to the ***NAVFAC Energy Criteria Team,*** E-mail address: ***energycriteam-@nfesc.navy.mil.***

Note: Portions of this article were extracted from PSIC-generated project submissions.

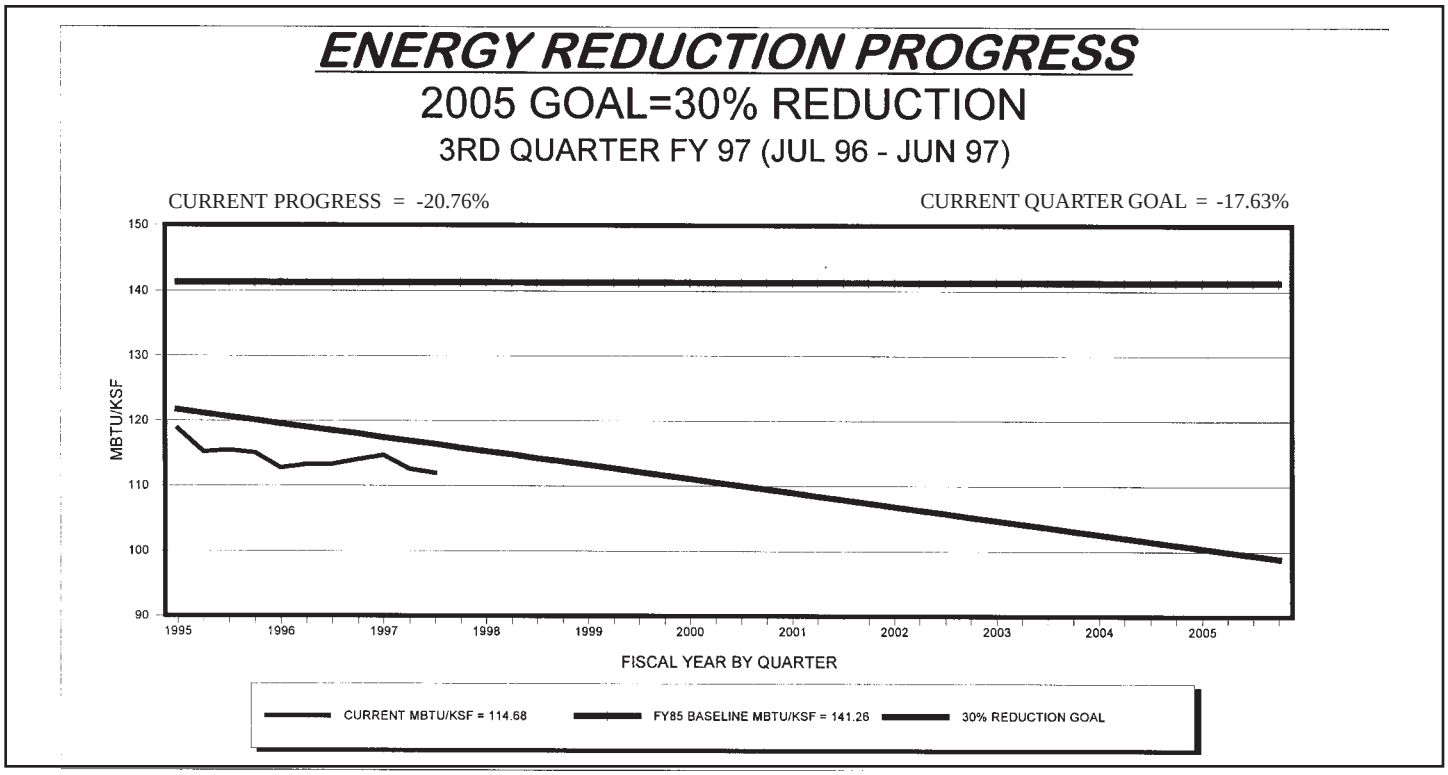
Naval Activity Energy Consumption for Jul 96 - Jun 97 (3rd Qtr FY97)*

Includes Housing and Shore for Navy and Marine Corps Activities; excludes Government Owned/Contractor Operated (GOCO), Cold Iron, Transmitter, Simulator and Miscellaneous Support

Energy Type	MBtu Consumed		Change From FY85 (%)	By Energy Type (%)
	Apr 96 - Mar 97	FY85**		
Electricity	29,929,210	29,054,497	3.01	42.42
Fuel Oils	12,486,310	26,993,823	-53.74	18.94
Natural Gas	23,412,242	25,528,327	-8.29	31.70
Propane Gas	264,756	314,986	-15.95	0.37
Coal	2,209,191	4,106,710	-46.21	3.55
Steam & Hot Water	991,344	1,288,378	-23.05	1.46
Residual	910,713	1,240,804	-26.60	1.26
Distillate	146,575	63,408	131.16	0.21
Reclaimed Oil	53,611	244,430	-78.07	0.08
Total (12 Months)	70,403,952	88,835,363	-20.75%	100.00%
Navy and Marine Corps (ksf)	628,967	628,889	-0.01%	
Navy and Marine Corps (MBtu/ksf)	111.94	141.26	-20.76%	
Navy Shore and Housing (MBtu/ksf)	118.52	149.81	-20.89%	

* The interim energy reduction goal for the end of June 97 is -17.63% below FY85 consumption. The percentage is derived by straight line interpolation of the 30% decrease per gross square foot from FY85 to FY2005.

** These FY85 figures incorporate all corrections approved to date.



Introducing Jim Heller

Head, Energy Programs Branch, ESC221

Jim is one of those rare individuals who really enjoy their work! He is a Registered Professional Engineer in California and earned a Bachelor of Science degree in Engineering Science from the State University of New York, Stonybrook, and a Master of Science degree in Mechanical Engineering from the University of California, Berkeley. Jim also holds a California Community College Instructor's Credential, where he has taught physics and math in addition to his 15 years of energy engineering experience for the Navy. Jim's life goal has been to work toward better management of natural resources and the reduction of energy and resource waste. ESC221 is the perfect place to promote the reduction of utility costs and energy consumption for Navy facilities worldwide.

The cost of operating our Navy bases and assisting activities achieve greater energy efficiency is a top priority. Jim's branch executes the Navy's energy projects and energy awareness programs. Program management support to NAVFAC Headquarters, technical assistance to PWCs and EFDs, development of the Navy's annual energy plan, and DUERS data reporting are a few of the services ESC221 provides. For more details, contact Jim at (805) 982-3486, DSN: 551-3486, or Internet: jheller@nfesc.navy.mil.

New E-UCAR Spreadsheets

The UCAR (NAVCOMPT Form 2127) is a management tool prepared by an activity's utilities department and comptroller. This report summarizes quantities and costs of all utilities purchased, produced, and distributed at an activity.

Until recently, producing this report was a cumbersome, manual process prone to errors. Now the UCAR is available on a computer spreadsheet called the E-UCAR, developed by a team comprised of NAVFACENGCOM, LANTDIV, SWESTDIV, and ESC personnel. The new spreadsheet reduces the amount of data entry, calculates quantities, and produces management indices to track operating costs and efficiencies.

The E-UCAR can be used to:

- Develop cost and energy consumption trends.
- Project and prepare the utilities operating budget.
- Establish and review utility rates.
- Compare operating costs and revenue.
- Monitor efficiencies of electrical systems, boilers, and chiller plants.
- Project operating costs for future major projects.
- Provide an early warning of potential problem areas.
- Prepare the utilities portion of the Base Support One (BS-1) budget exhibit.
- Prepare the Defense Utilities and Energy Reporting System (DUERS) data.

The E-UCAR spreadsheet operates in Microsoft Excel 5.0 and is designed for annual reporting in monthly increments. Activities have been requested to submit monthly UCAR updates via the E-UCAR for incorporation into the E-UCAR database. Send your input to: scannon@-nfesc.navy.mil or mail to: Commanding Officer, NFESC, 1100 23rd Avenue, Port Hueneme, CA 93043-4370.

Copies were distributed to major claimants for distribution to their activities. If you would like a copy of the spreadsheet and instruction book, contact your major claimant or call ***Stephen Cannon,*** DSN: 551-1453.

Hands-on instruction is given during UCAR/DUERS training classes. Dates, locations, and an instructor listing for these classes is available on the Navy Energy Home Page, http://navy.energy.mil, as well as operating instructions and the ability to download the E-UCAR spreadsheet. Questions may be directed to any one of the following:

Joy Pascall (757) 322-4696
Johnny Johnston (619) 532-1921
Dave Borroel (805) 982-3494
Stephen Cannon (805) 982-1453

Plans for FY98 include collection of E-UCAR spreadsheets on a regular basis at a central location in ESC, development of a UCAR database containing activity UCARs, and access to the data from the web.

The Navy spends $752,000,000 on shore facility utilities each year -- the single largest line item in the operating budget.

Energy and water conservation deliver a wide range of benefits, such as dollar savings, reduced pollutant emissions, and in some cases, increased productivity.

You're saving more than natural resources when you do your part to use energy wisely.

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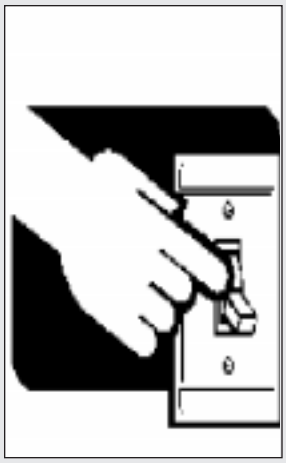
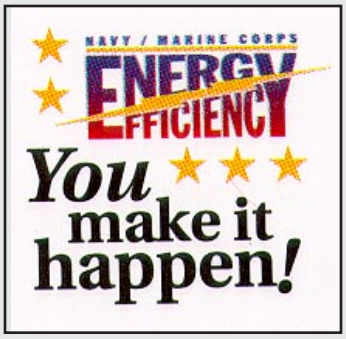
We all need time off -- including your office equipment.

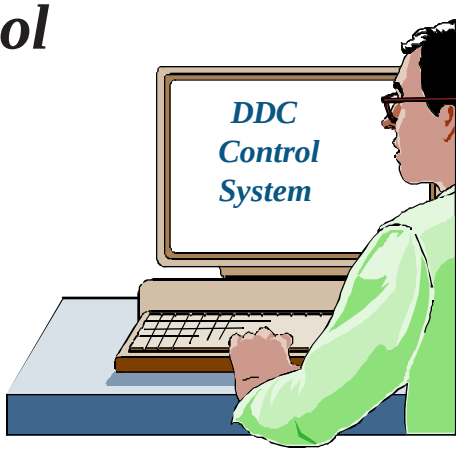


Turn off photocopiers, printers, computers, computer monitors, and other office equipment at night and on weekends.

The Department of the Navy will avoid $3,800,000 a year in electricity costs when 100,000 Navy and Marine Corps personnel turn off their computers at night and on weekends.



Direct Digital Control Strategies



In the past, control of heating, ventilating, and air-conditioning (HVAC) equipment was accomplished using pneumatic and electronic type controllers. These controllers offered limited control strategies, resulting in less than ideal equipment control and building conditions. Additionally, excessive time was required to troubleshoot and maintain calibration of controllers and supporting equipment such as compressors and thermostats. The development and acceptance of microprocessor-based controllers, commonly called direct digital control (DDC), provides the ability to take advantage of the flexibility that "software-based" control strategies provide. DDC provides both improved control and a real time "window" into the operation of the building's HVAC equipment, resulting in improved trouble-shooting, maintenance, and energy management.

Based on our experience with DDC, we have found the following control strategies and tips useful, but not necessarily common in digital control of HVAC systems.

Actuate Valves During Unoccupied Hours. This is an extremely useful concept when applied to variable air volume (VAV) reheat valves.Commanding the actuators to stroke the valve fully open and closed once per day, minimizes the opportunity for valves to "freeze up" or stick over time. Because this action is commanded to take place during off hours, adverse temperature swings will not be experienced by building personnel. This concept can also be extended to other HVAC equipment.

Lighting Controls. Simple and effective DDC lighting control is available for both new construction and retrofit projects. "Sentry switches" provide the capability of centrally turning off overhead lighting automatically. The switches are automatically turned off by interrupting the supply voltage at the lighting circuit breaker panel. A digital controller is used to control and schedule normally closed relays that interrupt supply voltage to the lighting circuits. Power to the switch is restored, and override is accomplished by the occupant simply turning the switch back on. Using the DDC system, lights are scheduled off numerous times during unoccupied hours to ensure overridden lights are off. Substantial energy savings are realized, not only from containing after-hours use, but also because lighting will not be turned on the following morning until that particular office or area is physically occupied. This control can also be applied to high bay lighting and parking lot lighting.

Timed Local Override (TLO) With Zone Control. For large buildings, it is possible to limit the operation of your HVAC equipment to specific zones within your building. For example, only a particular occupied zone will go active based on a request from an occupant entering the building during off hours. During unoccupied hours, controllers are programmed to close all the unoccupied VAV dampers and allow only the time local override zone to operate. A large savings in fan energy is realized, due to the decrease in air volume required in the building.

Remote Metering. Energy monitoring, at building and equipment levels, is becoming popular due to the ease at which it can be accomplished using digital controllers. Meter manufacturers now design equipment with output signals for accomplishing remote metering. These signals are converted in software to the appropriate engineering units like kW, kWh, Btus, gallons, etc. Taking advantage of DDC trending capabilities, allows facility managers to easily accumulate and profile energy and utility data.

Indoor Air Quality (IAQ). Using volatile organic compound (VOC), and/or carbon dioxide (CO_2) sensors in your DDC system will provide better indoor air quality. Controlling the proper amount of fresh air entering the building can be accomplished by utilizing

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these sensors. Trend data of VOC and CO_2 concentrations may help in determining if possible IAQ problems exist. These types of sensors are sometimes combined with air flow monitoring stations located in the outdoor air duct.

Dynamic Control. DDC software allows you to take advantage of dynamic control strategies. For example, dynamically resetting an air handler's supply air temperature (SAT), based on zone temperature as opposed to outdoor air temperature (OAT). This type of scheme eliminates poor zone temperature control due to varying heating or cooling loads, and rapidly changing OAT. In general, it is advantageous to dynamically reset any control variable, that in the past has been held at constant values.

Splitting Control Sequence Programs Between Controllers. Control of an individual HVAC component, such as an air handling unit, should always be done using one digital controller. Design specifications should not allow sharing of control sequences between two or more digital controllers. For example, an air handling unit should not have its hot water valve operation program residing in controller "A", and its chill water valve operation programming in controller "B". This scenario does not allow for "stand alone" operation, and increases the probability of improper equipment operation due to networking problems.

Taking full advantage of DDC requires experience and knowledge. Personnel in ESC211 have extensive experience in the control of HVAC equipment using DDC.

If you have DDC application ideas or questions, please contact ***Bob Schoff,*** ESC211, 805-982-3572, DSN 551-3572, or Internet: bschoff@nfesc.navy.mil.

Accurate Billing for Potable Water Use

Interested in a Metering Plan?

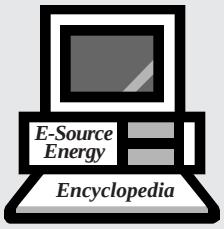
Typically, there are very few water meters on naval bases with the exception of main base meters at water treatment plants, storage tanks, and sources. Billing for potable water use at most facilities is based on engineering estimates that are derived from building square footage, use, and occupancy. During this era of constricting budgets and reduced operating costs, billing by an estimated cost becomes a problem when paying customers question their water bills. The optimal solution to this problem is to measure the actual water used by each customer; metering potable water use at the user level can be done. Public Works Center Jacksonville tasked ESC to determine the requirements for metering potable water use at the building level. Facilities at Naval Air Station Jacksonville and Naval Station Mayport were also included.

A team of ESC personnel performed an on-site investigation over a three-week period during July 1997. During this time, data was gathered from base and building-level drawings, local personnel, and physical investigation of the buildings. This data was used to generate a site specific report that determined the best type of meter to use at each site and optimal placement for accurate metering. In addition, several

buildings that were occupied by the same activity were grouped together when possible, for substantial savings on installation, maintenance, and reading costs. In one case, meter installation costs were reduced from $121,000 to $30,700 by metering a group of 16 buildings together, as opposed to individually.

This report provides requirements for each facility, including a materials list and pricing based on means cost data. Options for simple isolation or bypass piping configurations are included for each site. Site drawings can also be included when needed for clarification.

For more information on metering plans, contact ***Mike Rocha,*** ESC232, (805) 982-3597, DSN 551-3597, FAX (805) 982-3597, or Internet: mrocha@nfesc.navy.mil.



Have an Energy Question?

Access the web for the answer!

The NAVFAC Energy Criteria Team is posting a reminder that the E-Source Energy Encyclopedia is available through a site license to the Navy and Marine Corps.

It covers a broad spectrum of energy issues and applications and is available to the Navy and Marine Corps through the Worldwide Web at: *"http://www.energy.navy.mil."*

If web access is not available to you, a limited supply of the encyclopedia is available on CD-ROM. The current version is Release III, April 1997.

If your copy of the CD is outdated, or you would like to be added to the list, please send an e-mail requesting the update to: *"energycriteam@nfesc.navy.mil"*

Check us out on the Worldwide Web:

URL *http://www.nfesc.navy.mil*
or
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For Technical Assistance, call:

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